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TI - DISPLAY DEVICE

AB - PURPOSE: To adopt an using method that taking up to make compact and housing are carried out at the time of unusing and rewinding and opening are carried out only at the time of using by linearly providing a nonflexible driving part on a flexible display medium.  
 - CONSTITUTION: The driving part 2 composed of a Si chip 4, a driving circuit 2, etc., is stuck to one side of the rectangle flexible display medium 1 of a segment form formed by using high polymer dispersion type liquid crystal, and the flexible display medium 1 is opened/used at the time of the using, and can be taken up by using one side having the driving part 2 as a shaft at the time of the unusing. Therefore, the using method that the display medium 1 is made compact and housed at the time of the unusing, and opened only at the time of the using, is adopted. This display device suitable for carrying can be realized, and applied for a small-sized computer and the display device of a terminal device. Further, a connector is provided on the top end of a power source/signal conductor 5.

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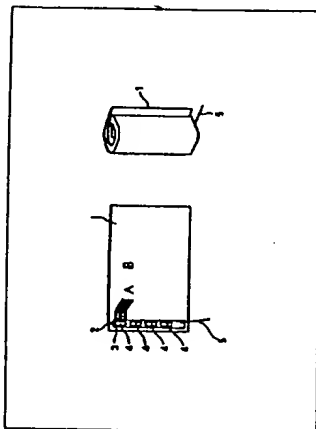
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IN - KATO KINYA; others: 04

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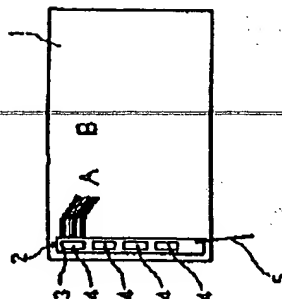
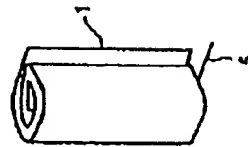
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<NTT>;

INVENTOR : SAKAI SHIGENOBU;

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**ABSTRACT :** **PURPOSE:** To adopt an using method that taking up to make compact and housing are carried out at the time of unusing and rewinding and opening are carried out only at the time of using by linearly providing a nonflexible driving part on a flexible display medium.

**CONSTITUTION:** The driving part 2 composed of a Si chip 4, a driving circuit 2, etc., is stuck to one side of the rectangle flexible display medium 1 of a segment form formed by using high polymer dispersion type liquid crystal, and the flexible display medium 1 is opened/used at the time of the using, and can be taken up by using one side having the driving part 2 as a shaft at the time of the unusing. Therefore, the using method that the display medium 1 is made compact and housed at the time of the unusing, and opened only at the time of the using, is adopted. This display device suitable for carrying can be realized, and applied for a small-sized computer and the display device of a terminal device. Further, a connector is provided on the top end of a power source/signal conductor 5.

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**CLAIMS**

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[Claim(s)]

[Claim 1] Display characterized by providing the display cell which has the 1st rigid field and the 2nd field which has flexibility, and has the pixel arranged so that the viewing area which continued over the 1st above-mentioned field and the 2nd field might be formed, and the driver IC which is alternatively arranged in the 1st above-mentioned field, and drives the above-mentioned pixel.

[Claim 2] In the display which has the viewing area which consists of a pixel arranged in the shape of a matrix, and has flexibility A means to supply a status signal to the above-mentioned pixel, and the sensor which is arranged in the line writing direction and the orientation of a train of the above-mentioned pixel of the above-mentioned viewing area, and outputs a signal according to the incurvation status of the above-mentioned liquid crystal cell, the above of the above-mentioned liquid crystal cell which a detection means to detect the field crooked with the flat liquid crystal cell [ above-mentioned ] field with the above-mentioned signal which the above-mentioned sensor outputted, and the above-mentioned detection means detected -- so that a display may be performed, using a flat field alternatively Display characterized by providing a means to compress the above-mentioned status signal.

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[Translation done.]

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⑮ 発明の名称 表示装置

⑯ 特 願 平2-306270

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明 細 書

1. 発明の名称

表示装置

2. 特許請求の範囲

1. 可換性表示媒体に非可換性の駆動部を直線状に設け、上記駆動部を設けた部分を軸として上記可換性表示媒体を巻き取って収納するようになっていることを特徴とする表示装置。

3. 発明の詳細な説明

(産業上の利用分野)

本発明は、表示装置に係り、特に、表示装置の収容形態に関する。

(従来の技術)

液晶ディスプレイ(LCD)に代表される、薄型で低消費電力の平面型表示装置(ディスプレイ)の研究開発が盛んである。

従来、これらのディスプレイは非可換性のガラス基板上に形成されていたため、未使用時に小さく収容することができなかった。しかし、ガラス基板の代わりに高分子フィルムを基板として用い

れば、曲げたり、丸めたりできる表示媒体の形成が可能であり、未使用時に小さく収容することができる。特に、高分子膜中に液晶を球状等の形状で閉じ込めた高分子分散型液晶はフィルム状に形成することができるので、導体を形成したフィルムと積層することにより、容易に可換性の表示媒体が実現できる。

(発明が解決しようとする課題)

しかし、上記の表示媒体は曲面を持った自動車のフロントガラス等に張り合わせたり、表示を円筒状または半円筒状にすることが必要な部分に適用することしか考えられていなかった。

本発明の目的は、上記可換性の表示媒体の用途を広げるためになされたもので、未使用時に表示媒体を小さく収容できる新たな収容形態を有する表示装置を提供することにある。

(課題を解決するための手段)

可換性表示媒体は特に曲面を持ったガラス等に張り合わせて用いる等の用途に限られることなくそのままでも使用可能である。しかし、可換性表

込み機構、巻き戻し機構は使用時の利便を考慮して種々工夫可能である。さらに、上記実施例において、高分子分散型液晶を用いたセグメント形式の表示媒体 1 を示したが、これに限定されることなくマトリクス方式の表示媒体が当然使用可能なことは言うまでもない。

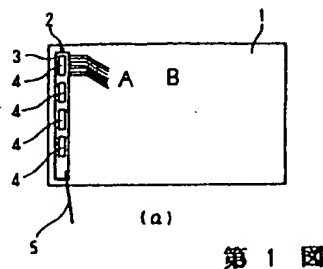
〔発明の効果〕

以上説明したように本発明では、未使用時に可換性表示媒体を収納できるので、可搬に適した小型のコンピュータや端末装置の表示装置を提供することができる。

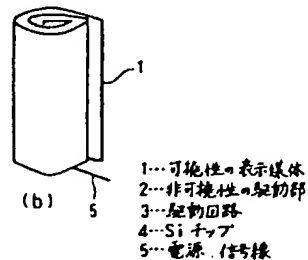
4. 図面の簡単な説明

第 1 図 (a) は、本発明の第 1 の実施例の表示装置の概略平面図、第 1 図 (b) は、収容した状態の表示装置を示す概略斜視図、第 2 図 (a) は、本発明の第 2 の実施例の表示装置の概略斜視図、第 2 図 (b) は、収容した状態の表示装置を示す概略斜視図である。

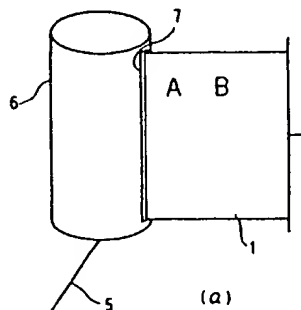
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- 2…非可換性の駆動部



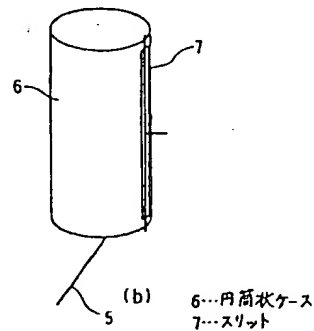
第 1 図



- 1…可換性の表示媒体
- 2…非可換性の駆動部
- 3…駆動回路
- 4…Si チップ
- 5…電源・信号線



第 2 図



- 6…円筒状ケース
- 7…スリット

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

~~[The technical field to which invention belongs]~~ Especially this invention relates to flat-surface type display, such as a LCD, about display. Moreover, this invention relates to display, such as a LCD constituted especially using the resin substrate, about the display which has flexibility. Moreover, this invention relates to the display which can be crooked in a display cell.

[0002]

[Description of the Prior Art] Flat-surface type display, such as a LCD (following LCD) and a plasma display panel (following PDP), is spreading as display and flat TVs, such as a personal computer, recently, in order that there may be little depth and it may end compared with CRT. Moreover, the display constituted as a member which constitutes flat-surface type display using the substrate material which has flexibility, such as a film-like plastic plate, although the glass substrate was conventionally common is also proposed. Furthermore, a screen size is becoming large gradually.

[0003] However, when it is the flat-surface type display with the large size of the display screen, although it ends, the space equivalent to a display area which the location occupied if compared with CRT has, and ends is required, and this space becomes large according to the display screen. [ quite little ]

[0004] On the other hand, flat-surface type display has spread widely also as display of various kinds of pocket devices, such as note types PC and PDA, a cellular phone, and a car-navigation system. Since importance is attached to portability in such a carried type device, the size of the display screen has a constraint. For this reason, there is a problem that sufficient amount of information and a display quality are not obtained, and it has been a technical problem to solve the contrary problem of the size of portability and the display screen.

[0005] As flat-surface type display which is \*\* space and has a big screen, the structure it enabled it to contain in the big size at the time of use and a size small at the time of intact is desired.

Drawing 17 is drawing showing the example of the configuration of the conventional rolled-round type display roughly. The flat-surface type display 90 which this display becomes from the flexible substrate currently formed by plastics is rolled round on a roll 92 at the time of intact, and receipt can be made to do it. Thus, if it is the display which can be rolled round at the time of un-using it, also in a pocket device, at the time of use, it can be large, can be made small at it at the time of carrying, and can be compatible in a demand of portability, and a demand of the size of the display screen.

[0006] Common flat-surface type display has the driver IC in the orientation of X and the orientation of Y of a pixel pixel matrix which constitute the display screen, in order to drive the pixel which constitutes the display screen. The driver IC is formed as rigid semiconductor devices, such as silicon, and has the structure of connecting this driver IC to the periphery of flat-surface type display by ACF (anisotropy electric conduction layer), the conductive bump, etc. However, in rolled type flat-surface type display, too much stress was applied to this driver IC at the time of receipt, and there was a problem are easy to damage a driver IC.

[0007] Moreover, \*\* 1 \*\* bent and common flat-surface type display had the problem that a display quality deteriorated, when making it display by extending a roll.

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at least one side of display using the display which used the plastic plate and which can be rolled. According to the incurvation status of the display cell detected by the sensor, it is made to perform the display screen for reduction, an expansion, adjustment of resolution, etc. so that a display may be performed only using a flat viewing area. Thus, in the display of this invention, it can double with the size of an effective viewing area, and can carry out adjustable [ of the size of a display image ]. The 3rd aspect of the display of this invention is [0018].

[Claim 1] Pocket display which forms a LCD in the substrate of the organic substance and is characterized by enabling receipt in a cylinder type container.

[0019]

[Claim 2] The LCD characterized by having used the organic substance as the substrate and installing a drive circuit, package parts, a package substrate, and the display light source in one edge of a screen.

[0020] As a remedy to the above-mentioned problem, arrangement of a drive circuit, package parts, a back light, and a light guide plate was \*\*\*\*ed particularly, and the technical problem was solved by making bending possible. Moreover, the upright parts which bar bending were bent, and it removed from the section, and installed in the fraction which does not interfere with an operation of LCD.

[0021] Such a display was made into the structure which can be installed in a pocket device.

[0022] According to this invention, since the curvature of a bending fraction is controllable, the quality of image of the bending section can be kept good. Thereby, deformation of the bending section, distortion, and peeling of a substrate were able to be prevented. Moreover, the upright parts which interfere with bending were bent, and it removed from the section, and installed in the fraction which does not interfere with an operation of LCD. moreover, functions, such as a cellular phone and portable \*\* \*\* \*\*\*\*\*, -- constructing -- \*\*\*\* -- a big screen product is realizable to a small capacity with things

[0023]

[Embodiments of the Invention] It explains still in detail about the display of this invention below.

(Operation gestalt 1) View 1 and the drawing 2 are drawings showing the example of the configuration of the LCD of this invention roughly. Drawing 1 is the example which developed the flat-surface type display which has a rigid field and a flexible field to the busy condition. Drawing 2 shows a mode that the flat-surface type display shown in drawing 1 was contained, from the shaft orientations of a roll.

[0024] The display cell 1 is equipped with the viewing area 2 which a pixel comes to arrange in the shape of a matrix, and the driver IC 3 which impresses a status signal to each pixel. Moreover, this display cell 1 is equipped with rigid field 1a arranged by turns beltlike and flexible field 1b. And the driver IC 3 is alternatively arranged only in rigid field 1a of the display cell 1.

[0025] Moreover, the roll 6 which has a bay and the curvilinear section on a periphery is formed in the end of the display cell 1. In this example, the control circuit which controls a driver IC 3 is built in the roll 6.

[0026] And the bay of a roll 6 corresponds to field 1a with a rigid display cell in the case of rolling up, and the curvilinear section is constituted so that it may correspond to field 1b with a flexible display cell. Therefore, in case the display cell 1 is rolled round on a roll 6, a driver IC 3 is maintained at a flat and it can prevent that the stress which destroys IC chip is impressed.

Although the roll 6 was made into the structure of having one bay and the one curved-surface section, in this example, you may be made to have two or more bays and curvilinear sections.

[0027] Moreover, it is good also as structure which constitutes the cross section of a roll 6 in a polygon configuration, and contains a driver IC into the fraction of the polygonal side, i.e., a bay. When the number of polygons is odd (for example, right 9 square shapes), it is good also as structure where a driver IC is contained by the bay in every other one. Since it is contained so that the driver IC of the odd roll and the driver IC of the even roll may lap by turns from a roll side at this time, the stress applied to a film substrate or a driver IC can be reduced further.

[0028] Drawing 3 is drawing showing another example of the configuration of the display of this



invention. It constitutes from this example so that the cross section of a roll may become abbreviation triangle-like. Also by adopting such a configuration, the stress impressed to a driver IC 3 can be reduced. Moreover, when the display cell 1 is rolled round, it is desirable to constitute so that two or more driver ICs 3 incline and may not lap with one side of a polygon. Moreover, although considered as the structure which has arranged the driver IC 3 on both sides of a display here, single-sided arrangement is sufficient as a driver IC 3. Furthermore, although the driver IC 3 set to silicon IC, you may be made to form the driver which consists of a TFT array which used poly-silicon for the channel semiconductor layer, for example on a flexible substrate. Thus, it is desirable that the field in which the display cell and the driver line formed \*\*\*\*\* also in the display constituted in one constitutes so that it may correspond on the straight line of a roll 6 at the time of receipt.

[0029] Moreover, although the roll 6 which rolls round a display cell was made into one piece, the number of rolls 6 may have more than one here. For example, it may have a roll the one side which counters one side of the display cell 1 with one piece and it, and it may be carried out to a configuration which is rolled round from both sides. Drawing 4 is drawing showing roughly the configuration of the display of this invention equipped with the two roll. Here, the configuration which rolls round the display cell 1 with the roll, roll 6a and roll 6b, of two is adopted. Thus, as shown in drawing, the same orientation is [ both ] sufficient as it, although a vertical opposite direction is sufficient as the rolling-up orientation of a display cell. The deflection of the display cell 1 can be suppressed by doing so. Moreover, as shown in drawing 4, support section 6x may be made to rotate further after receipt of the display cell 1.

[0030] Drawing 5 is drawing showing another example of the configuration of the display of this invention roughly. Drawing 5 (a) shows a mode that drawing 5 (b) was seen from the rear-face side of a viewing area, from the shaft orientations of a roll, respectively. This display has the flat-surface hold device 5 linked to the lower part of a roll 6. The display cell 1 can be stretched by predetermined tension according to this flat-surface hold device 5 at the time of use. Therefore, the deflection of the display cell 1 can be suppressed at the time of a display. Although the pantograph-like device is adopted as shown in drawing 5 here, what thing is sufficient as it as long as the structure of this flat-surface hold device 5 can hold the display cell 1 evenly.

[0031] Moreover, you may prepare and reinforce a support substrate at the background of a roll which carries driver-IC loading in the fraction in which the driver IC 3 shown in drawing 1 and the drawing 2 is carried.

1 [0032] The display of this invention can be used suitable for large-sized flat-surface type display  
2 and the display of for example, a pocket device, for example. Drawing 6 is drawing showing  
3 roughly the example which used the display of this invention as display of the personal digital  
4 assistant which has a cellular-phone function. This personal digital assistant 7 has contained  
5 module substrates, such as transceiver parts, a digital disposal circuit, CPU, and memory, the dial,  
6 the loudspeaker, the earphone, etc. inside. Moreover, the destination, the telephone number, etc.  
7 which were processed by CPU are displayed on the display cell 1 arranged so that it could pull out  
8 from the side face of the mainframe 8 of an information terminal. An input unit may be formed  
9 out of the display screen like a keyboard, and may be formed in the display screen like a pen  
10 input. When not using it, the display cell 1 is rolled round with the roll 6 arranged in the interior  
of the mainframe of an information terminal, and is contained.

[0033] Next, the example of the manufacture technique of the flat-surface type display of this invention is explained. In addition, here explains the example of a rolled type LCD.

[0034] It is SiO<sub>2</sub> first. On the transparent substrate of the plastics in which the surface-protection layer of a grade was formed, MoTa, Cu, Al alloy, 3000nm of MoWs etc., etc. were made to deposit, etching was performed, and the pattern of the gate, Cs line, and the address line was formed. Next, the laminating of SiO<sub>x</sub> 3000nm and the SiN<sub>x</sub> 500nm was carried out as an insulator layer by the plasma CVD method, and 2000nm and 200nm of Mo were deposited [ undoping a-Si ] for 1000nm and n+a-Si.

[0035] Next, etching formation of the island of a-Si was carried out by CDE (chemical dry etching).

[0036] Next, the pixel electrode was formed by ITO. Next, a signal line, the source, and the drain were formed by A1. CF<sub>4</sub> / O<sub>2</sub> n+a-Si of the channel section was etched by dirty [ dry ] or dry CDE.

[0037] Next, SiNx A \*\*\*\*\* pay \*\*\*\*\* layer is formed and it is SiNx of a pixel and the contact pad section. It etched. It has arranged in parallel [ the orientation of the channel width of a transistor ] with the bending orientation, or perpendicularly, and the degradation of TFT property by the stress by bending was prevented. The seal of the opposite substrate in which this array substrate, ITO, and the light filter were formed is carried out, liquid crystal is enclosed, and a display cell is formed.

[0038] In using TN cell, in order to avoid the stress by bending, as for the orientation of rubbing for the orientation of liquid crystal, it is desirable to form an array and an opposite substrate in bending with a combination perpendicular to parallel. Moreover, it is better to have boiled the gap spacer with adhesives etc. and to consider as a fixing formula more so that a cell gap may not change, when it bends.

[0039] Next, a signal line and a gate line are pulled out around a plastic plate, and it connects with a driver IC. the technique that an anisotropy electric conduction layer is used for the technique of connection, the technique using an electric conduction paste, and a plastic plate - \*\*\*\*\* -- although there were technique of carrying out a pressure welding like, the technique of carrying out solid phase diffused junction, etc., the anisotropy electric conduction layer was used here moreover, it built in the roll side of a substrate -- it is -- it is -- the drive circuit for picture signals and CPU are formed in the formed package substrate or plastic plate Moreover, a back light may be prepared in the roll section and may prepare a back light device in a display background independently. Here, the back light was prepared in the roll side, and the light guide substrate was formed with the fully supple elasticity plastics or bellow-cross-parallel-type light guide plate so that bending might be possible. Bending also of a scattered plate and a prism array is similarly made possible. For the orientation of prism to make the orientation of a major axis perpendicular to the bending orientation, and what is necessary is just made to make it in agreement with the orientation of a major axis. Moreover, at the time of display use, it can be flat, and you can make it flexibly crooked by forming the plate with rigidity in the rear face of a display at the time of receipt.

[0040] In addition, you may be made to apply to the simple \*\* \*\* \*\*\*\*\* type LCD which does not prepare a switching element like TFT in each pixel, without restricting to an active matrix type LCD. Moreover, the TFT which is not limited to the TFT which used the a-Si semiconductor layer, but used poly-Si for the channel semiconductor layer is sufficient as the TFT to use. A penetrated type or a reflected type is sufficient as a display mode. Furthermore, not only TN but a guest host, strong dielectric liquid crystal, etc. are sufficient also as the display mode of liquid crystal. Moreover, the substrate to use is not limited to plastics but may be made to use the metal layer which has flexibility and a springiness.

[0041] (Operation gestalt 2) The thing lightweight small is important for the pocket information device. - That a Personal Digital Assistant should display from a way, the conventional electronic notebook, an information communication, etc., amount of information increases and also increases further from now on. Therefore, the display screen which displays many informations if needed is required for the pocket information device. As display screen of a pocket information device, flat-surface type display, such as a LCD, is used abundantly. This is because LCDs are lightweight and low-power type flat-surface display.

[0042] In the prior art, it was incompatible in the portability of a pocket information device, and the size of the display screen. In order to improve portability, the conventional pocket information device had the small display screen. Although the device should be small when carrying, the display screen was also miniaturized according to the miniaturization of a device. In a prior art, even if it can carry out [ large-sized ]-izing of the display screen, it is a limitation that this reduces the frame of the display screen.

[0043] As the cause, the LCD which is the display screen of a pocket information device can raise with a display having the structure by which the modularization is carried out.

[0044] This is concretely explained using drawing 7. Drawing 7 is drawing for explaining the module structure of the LCD which used TAB. The active matrix drive of the viewing area 101 is carried out, and the scanning-line driver chip 102 and the signal-line driver chip 103 corresponding to the orientation of chi and the orientation of Y are mounted on TAB104 and the printed circuit board 105, respectively. The scanning-line driver chip 102 and TAB104 are connected to the scanning electrode pulled out from the viewing area 101. Similarly, the signal driver chip 103 is connected using the signal-line electrode and TAB104 which were pulled out from the viewing area 101.

[0045] Further, such a typical module is built into a bezel and constitutes a pocket information device. Since TAB is rich in flexibility, it can bend TAB section to the background of a viewing area 101, and can make the size of a liquid-crystal-display module small. However, since the connection of TAB104 and the driver chips 102 and 103 have rigidity, a viewing area cannot be made crooked by the pocket information device using a liquid-crystal-display module which is shown in drawing 7, even when a viewing area is created by the flexible substrate even if.

Therefore, when the conventional liquid crystal module is used, the size of display will determine in the size of a pocket information device.

[0046] Drawing 8 is drawing showing typically the LCD illustrated to drawing 7. It was the conventional LCD that the scanning-line driver 202 and the signal-line driver 203 exist in at least two sides of a viewing area 101. Since the connection between the scanning-line driver 202, the signal-line driver 203, and a viewing area was kept good, a viewing area 101 was not able to be made crooked from the rigidity of a driver and a printed circuit board.

[0047] Moreover, using a plastic plate is proposed as a substrate material of a LCD. However, the advantage which uses plastic material as a substrate is not fully demonstrated. Now, the main advantages using a plastic plate are shock resistance and a weight. the characteristic feature of plastic material -- a glass substrate -- a ratio -- it is strong to \*\* and bending stress, and is in the place which can be rolled ultimately

[0048] Furthermore, consideration is not carried out for the user-friendliness in the status that the power point is put only on \*\* space or portability, and the display which can perform rolling-up receipt is displayed.

[0049] Drawing 9 is drawing for explaining the problem on a display of rolled-round type display. Suppose that the image "alpha" is displayed on the viewing area 101 as shown in drawing 9 (a). If a viewing area 101 is rolled in this status, the whole display "alpha" cannot be displayed in effective viewing-area 101b in the visible status. Therefore, - section of a display is missing and a user interface will be in the very low status. Such status may not be desirable. For example, when using \*\* 1 \*\* type display for portable, it is the case where he wants to see all displays where display is rolled etc.

[0050] In this meaning, the size of a picture image and the size of display corresponded by the one for one, and, as for the conventional display, degree of freedom was very low between the sizes of a picture image and display. Therefore, the size of the conventional pocket information device and the size of a picture image were mostly in agreement. Although many informations were needed for the viewing area as mentioned above, the viewing area also had to be miniaturized in the limit of a size called portability.

[0051] Drawing 10 is drawing showing the example of the configuration of the display of this invention roughly. The sensor 402 and the sensor 403 which detect the incurvation status of a viewing area 101 are arranged by chi shaft orientations of a viewing area 101, and Y shaft orientations to the viewing area 101, respectively. The X-axis sensor 402 and the Y-axis sensor 403 are connected to the detection circuit 404 of the X-axis, and the detection circuit 405 of Y-axis, respectively.

[0052] The detection circuit 404 of the X-axis is connected to the signal-line driver 406, and the detection circuit 405 of Y-axis is connected to the scanning-line driver 407, respectively.

[0053] In the configuration mentioned above, a viewing area 101 should just be the LCD created using the plastic plate. The LCD strong against bending stress which can be rolled is created, using a polyarylate, a polyether ape phon, and a polysulfone as a plastic plate. The active matrix

type LCD which controls each pixel by TFT is used for a LCD. The scanning-line driver 407 and the signal-line driver 406 are connected using TAB wiring, and the scanning-line driver 407 and the signal-line driver 406 centralize further the scanning-line section 408 and the signal-line section 409 of this LCD on - side of a viewing area 101, for example, the side of the scanning-line signal input section, respectively. It is \*\*\*\*\* to roll round a part also to Y shaft orientations, if it is possible to roll a viewing area 101 to chi shaft orientations by doing in this way and a drive system is further centralized on a part of side of the scanning-line signal input section.

[0054] What is necessary is just to use the strain gage from which resistance changes with stress, for example as sensors 402 and 403. Drawing 11 is drawing for explaining a mode that the display cell was rolled. Two or more strain gages 402 are installed in the viewing area 101 of a display cell. The resistance of strain-gage 402b which is coming to the fraction by which the viewing area 101 is rolled changes. Based on change of this resistance, the incurvation status of a viewing area 101 is detected by detectors 404 and 405. And 406 and 407 are performing infanticide of a status signal, complement of a status signal, change of resolution, etc. so that it can display only using the viewing area distinguished when it was in the almost flat status. When an effective viewing area becomes small by adopting such a configuration, on the whole, the content which should be displayed can be displayed. Therefore, a user interface can be improved.

[0055] Drawing 12 is drawing for explaining the example of an operation of the display of this invention. Here, when [ of the strain gage of Y shaft orientations ] 402 rolls one display cell explains the case where stress is received. the strain gage 402 has received bending stress -- the detector 404 of the orientation of a signal line -- through and the signal-line driver 409 -- a display image -- full-screen dimension X0 \*\*\*\* -- dimension X1 of an effective viewing area It is made to compress. Consequently, a display will be displayed only on viewing-area 101b. Drawing 13 is drawing for explaining the example of a display of the display of this invention. That is, as shown in drawing 13 (a), it is full-screen x0. The picture image currently displayed is X1 as shown in drawing 13 (b). It can compress and display.

[0056] A configuration into which a picture image is compressed is similarly carried out about Y shaft orientations. Therefore, the compression display of the picture image can also be carried out simultaneous also to X shaft orientations and Y shaft orientations.

[0057] When the display which can be rolled is used by adopting such a configuration, even if it sets a display cell as a desired size, the picture image of a viewing area is compressed into the set-up size, and can store a display image within the limits of it.

[0058] moreover, an origin [ sensor / which detected stress in drawing 12 ] -- for example, a part of viewing area 101 -- the original picture image is displayed on 101b, and a picture signal is not sent to the remaining viewing area, but it may not be made not to display a part of picture image By adopting such a configuration, power consumption can be reduced by not transmitting a picture signal to an unnecessary viewing area. With the display of a carried type device, the time of a device can be lengthened especially by doing in this way.

[0059] (Operation gestalt 3) The active matrix liquid crystal display which prepared \*\*\*\*\* run \*\*\*\*\* (TFT) using a noncrystalline silicon (a-Si) layer or p-Si (poly silicon) as a switching element attracts attention in recent years. By constituting TFT array using the a-Si layer to which low-temperature membrane formation is made using a cheap noncrystalline glass substrate, it is because a reflected type, a large area, highly minute, and a high-definition and cheap panel display (flat type television) may be realizable. By the way, when using this kind of display for the device for bands, lightweight-ization is attained by using plastics for a substrate. It is more desirable for it to be bulky at the time of carrying, and to contain at the time of carrying and to be able to miniaturize, since it is inconvenient, although the larger one tends to use the size of a display when using a portable equipment. However, since the conventional TFT-LCD was formed in the upright glass substrate, it was difficult to change the configuration. on the other hand -- since plastics can deform, it is small by rolling the display of a big screen at the time of a display -- carrying out -- carrying -- suppose that it is easy However, the rolled type LCD was not realized conventionally.

[0060] When it was going to contain the screen of a LCD in a roll container, the technical

problem that it was difficult to bend by the upright member occurred. Moreover, in the portable equipment, since it was inconvenient to carrying, it was difficult to install the display of a big screen.

[0061] Drawing 14 is drawing showing roughly the example of the unit pixel configuration of the display of this invention. This example explains the configuration of the unit pixel of a LCD. SiO<sub>2</sub> On the transparent substrate 10 of the plastics in which the surface-protection layer (not shown) of a grade was formed, 3000Å deposition of MoTa, Cu, Al alloy, the MoW, etc. was carried out, etching was performed, and the pattern of gate 11a, Cs line 11b, and address-line 11c was formed. Next, the laminating of SiO<sub>x</sub> 3000nm and the SiN<sub>x</sub> 500nm was carried out as an insulator layer 12 by the plasma CVD method, and 2000nm and 200nm of Mo13c were deposited [ undoping a-Si13a ] for 1000nm and n+a-Si13b. Next, etching formation of the island of a-Si was carried out by CDE. Next, the pixel electrode 14 was formed by ITO. Next, a signal line 15 and source 15aN drain 15b were formed by Al. CF<sub>4</sub> / O<sub>2</sub> n+a-Si of the channel section was etched by dirty [ dry ] or dry CDE. Next, SiN<sub>x</sub> The \*\*\*\*\* layer 16 is formed and it is SiN<sub>x</sub> of a pixel and the contact pad section. It etched. It has arranged in parallel [ the orientation of the channel width of a transistor 17 ] with the bending orientation, or perpendicularly, and the degradation of TFT property by the stress by bending was prevented.

[0062] The seal of the opposite substrate in which this array substrate, ITO, and the light filter were formed is carried out, liquid crystal is enclosed, and a cell is formed. In using TN cell, in order to avoid the stress by bending, as for the orientation of rubbing for the orientation of liquid crystal, it is desirable to form an array and an opposite substrate in bending with a combination perpendicular to parallel. Moreover, it is better to make a gap spacer into a fixing formula with adhesives etc. so that a cell gap may not change, when it bends.

[0063] Drawing 15 is drawing showing the configuration of the display of this invention roughly. Here, the case where this invention is applied to a LCD is explained.

[0064] It connects with LSI for a drive21 which collected signal lines 15 around substrate plastics 10, and was formed in the end. The address line 11 is connected to LSI for an address-line drive22 in the side of the one orientation of a substrate. The parts of the drive circuit 24 for picture signals, the back light 25, the transceiver circuit 26, CPU27, and antenna others are formed in the package substrate 23 or plastic plate formed in the end of a substrate. Light guide substrate 28a of a back light 25 is formed with a fully supple elasticity plastics or bellow-cross-parallel-type light guide plate so that bending may be possible. Bending also of scattered plate 28b and prism array 28c is similarly made possible.

[0065] The orientation of prism makes the orientation of a major axis perpendicular to the bending orientation, and is made in agreement with the orientation of a major axis. Moreover, by forming the plate with synthesis in the rear face of a display, at the time of display use, it is flat, and is enabled to bend at the time of receipt.

[0066] The cylinder type container 29 is made to contain this TFT-LCD module. A container enables receipt of a TFT-LCD module as outer container 29a, and the solid casting mold or spiral type of content machine 29b. a supply wiring of the power to LCD, a signal, etc. is movable -- it wires so that it may be possible

[0067] You may attach the function of a cellular phone to a this roll type LCD. Drawing 17 is drawing for explaining the example which applied the display of this invention to the cellular phone. Module substrates, such as transceiver parts, a digital disposal circuit, CPU, and memory, the dial 31, a loudspeaker, and the earphone 32 are contained inside. Outside, a dial, the antenna 33, etc. are installed. The destination 35, the telephone number 36, etc. which were processed by CPU are displayed on a display 34. An input unit may be formed out of a screen like a keyboard, and may be formed in a screen like a \* \* \* input.

[0068] In addition, the simple matrix type which is not limited to an example and does not prepare TFT is sufficient as this invention. Moreover, TFT may not be limited to a-Si but p-Si is sufficient as it. A penetrated type or a reflected type is sufficient as a display mode, and not only TN but a guest host, strong dielectric liquid crystal, etc. are sufficient as the display mode of liquid crystal. The metal layer which is not limited to plastics but is elastic is sufficient as the substrate of LCD.

A rolled type display is not limited to a pocket information device, for example, it may be made to apply it to display, such as a video camera and a still camera. Thus, in the display of this invention, it can bend by keeping curvature uniform and bending in a smooth configuration in the configuration which does not bar the quality of image of a screen by devising arrangement of a circumference drive circuit, a package substrate, and a tooth-back protective coat.

[0069]

[Effect of the Invention] As explained above, according to the display of this invention, a rigid fraction and a flexible fraction can constitute a display cell, the field corresponding to a rigid fraction can form evenly the roll which rolls round a display cell, and the field corresponding to a flexible fraction can reduce such stress to a driver IC by forming in a curved-surface configuration at the time of receipt. Therefore, the reliability of display can be improved greatly.

[0070] Moreover, when using a display cell, a high display of quality of image can be performed by having the flat-surface hold device in which fixed tension is applied to a display cell, without a screen bending at the time of a display.

~~[0071] Moreover, by installing two or more sensors in the orientation of the scanning line and the orientation of a signal line of display using the display which can be rolled, respectively, even if it sets display as a desired size, the picture image of a viewing area is compressed into the set-up size, and can dedicate a picture image to a desired size. Therefore, a user interface can be improved. Furthermore, in viewing areas other than an effective viewing area, power consumption can be reduced by stopping a drive of a pixel.~~

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[Translation done.]